PCA ENGINEERING INC.
CIVIL ENGINEERING
SURVEYING
MATERIAL TESTING

CITY OF GILLETTE – 3 POINT CALIBRATION FOR NEW GNSS BASE - DATUM SHIFT TO EXISTING CITY DATUM

The purpose of this project was to determine if a simple 3 point translation could be utilized for the datum transformation from the new City base [broadcasting NAD83-2011(2010) position] to the original published City Horizontal and Vertical Control Networks [NAD83-(86)]. Given budget constraints involved, it was agreed the most logical method for this endeavor was to utilize RTK methods in order to observe as many stations as possible with the least cost per observation. While this method meets that criteria, it does not give more than a snapshot of the overall system and the precisions of this data do not allow for the isolation of smaller errors within the system.

PCA Engineering surveyed approximately 70 VCM monuments and 20 Horizontal Control monuments with some monuments observed multiple times in the course of this project. Overall, our results were quite good and we feel that this 3 Point calibration is adequate for the purpose of allowing users to perform RTK surveys within the published City datum. We did observe some outliers in the course of this work, particularly seeing some Horizontal Control points that may have been disturbed or subject to lateral movement due to their location. Some of these points were excluded from the adjustment calculations for these reasons; we did the same analysis/exclusion within the VCM network as well.

We also believe this is a good time to utilize our data to update the published VCM coordinates and descriptions to better reflect current conditions and have included this information in an updated spreadsheet. We have also included the spreadsheet we used in determining the required adjustment for the “best fit” to the original City network.

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The Metadata for the 3Point adjustment is as follows:

Coordinate System Details

Project : New City Base 3PT Calib.

Project Datum	(WGS 84)		
Vertical Datum		**Geoid Model**	GEOID12A (Conus)
Coordinate Units	US survey feet		
Distance Units	US survey feet		
Height Units	US survey feet		

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Coordinate System
Coordinate System : Wyoming State Plane
Zone              : East (4901)
Datum             : (WGS 84)
Ellipsoid Name    : (WGS 84)
Geoid Model       : GEOID12A (Conus)
Site              : NEW CITY BASE


Ellipsoid
Ellipsoid Name   : (WGS 84)
Flattening 1/f   : 298.257
Semi Major Axis  : 20925604.474sft


Datum Transformation : Three Parameter
WGS84 to (WGS 84)(3)
Translation X    :   0.000sft          Rotation X :             N/A
Translation Y    :   0.000sft          Rotation Y :             N/A
Translation Z    :   0.000sft          Rotation Z :             N/A
Scale Factor     :        N/A ppm


Transverse Mercator Projection
Projection Origin                      False Origin
Latitude      :   40°30'00.00000"NFalse Northing  :        0.000sft
Longitude     :  105°10'00.00000"WFalse Easting   :   656166.667sft
Height        :          N/A          False Elevation    :            N/A
Scale Factor  :   0.99993750


Shift grid name             :              None
Azimuth at projection centre :              N/A
Azimuth at equator           :              N/A
Projection Parallel 1        :              N/A
Projection Parallel 2        :              N/A
Projection Ferro Constant    :              N/A
Projection Point 1 Latitude  :              N/A
Projection Point 1 Longitude :              N/A
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Projection Point 2 Latitude	N/A
Projection Point 2 Longitude	N/A
Projection grid name	N/A

Local site settings

Project latitude	?
Project longitude	?
Project height	4600.000sft
Ground scale factor	N/A
False northing offset	N/A
False easting offset	N/A

GPS Site Calibration Details

Horizontal Adjustment

North Origin	1376599.529sft	Translation North	-1.870sft
East Origin	551467.532sft	Translation East	2.000sft
Scale	1.00000000	Rotation	0°00'00.000000"

Vertical Adjustment

North Origin	0.000sft
East Origin	0.000sft
Vertical constant correction	0.190sft
Slope North	0.000ppm
Slope East	0.000ppm

Network Adjustment Parameters

Longitude Deflection	N/A
Latitude Deflection	N/A
Azimuth Rotation	N/A
Network Scale	N/A
Distance Scale	N/A
Distance Constant	N/A
Height Constant	N/A